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Boston, MA 02109

EXAMINER

CLEVELAND, MICHAEL B

ART UNIT

PAPER NUMBER

1762

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/807,838	Applicant(s) GORDON ET AL.	
	Examiner Michael Cleveland	Art Unit 1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>021104</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 16-23 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16, 23, and 25: The phrase "said beta-diketonates being the same", "the beta-diketonates are the same", and "the beta-diketonate is the same" are unclear. The first two phrases are unclear because only one beta-diketonate is recited in the claims 1 and 16. Based on Applicant's arguments on p. 11, it appears that Applicant may mean that "said beta-diketonates being the same" is meant only to exclude the possibility that two different compounds of the formula MA_2N or may mean that both A groups are the same. The former would be redundant in claim 16 because it requires a liquid consisting essentially of a compound of the formula MA_2N and because Applicants' arguments at p. 11 demonstrate that mixtures of compounds of the formula MA_2N materially affect the properties of the composition, but the latter would not make sense in claim 25 because the formula MA_2N is not claimed.

Claim 18: The phrase "the alkaline earth metal or metals" is unclear because parent claim 16 excludes the presence of more than one metal in the liquid.

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 2, (7-11)/2, 13, and 16-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

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Claims 2, (7-11)/2, and 13: There is no support in the specification for compounds that are liquid both at 20 and 60 °C, as required by claim 2 as amended.

Claims 16-22: The specification provides support for providing a liquid consisting essentially of an amine-adducted alkaline earth metal beta-diketonate and vaporizing the liquid to contact its vapor with a heated surface to deposit a material containing the alkaline earth material, but does not reasonably provide support for contacting the liquid consisting essentially of the amine-adducted alkaline earth metal beta-diketonate with the substrate. Applicant's only disclosure regarding liquids teaches that they are applied in mixtures or solutions, which materially affect for the reasons given in the specification at p. 3, lines 21-25, p. 9, lines 1-6, and as argued by Applicant in the response on p. 11, 1st full paragraph.

There is particularly no disclosure of forming more than one metal compound (as at least partially claimed in each of claims 17-22) by contacting a liquid consisting essentially of an amine-adducted alkaline earth metal beta-diketonate to the heated substrate rather than a mixture of precursors of the mixed metal oxides. Furthermore, there is no teaching of using a sol-gel process using a liquid consisting essentially of an amine-adducted alkaline earth metal beta-diketonate.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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6. Claims 1-9, 14-15, and 23-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Baum et al. (U.S. Patent 5,919,522, hereafter '522). (Gordon (WO 98/46617, hereafter '617 is cited as evidence.))

Claims 1-2, 23-25: '983 teaches MA_nX (col.5, lines 5-33), such as $Ba(thd)_2(PMDETA)$ (pentamethyldiethylenetriamine) (col. 12, lines 18-22). Figs. 4 to 5 and col. 12, lines 18-42 demonstrate the separation and separate evaluation of $Ba(thd)_2(PMDETA)$ and $Ba(thd)_2(tetraglyme)$, thereby suggesting that the compound is isolated. The compound is further isolated by being vaporized (col. 12, lines 18-22). '522 does not explicitly disclose that $Ba(thd)_2(PMDETA)$ is a liquid at 60 and/or 20 °C. However, it is very similar to Applicant's particularly claimed compound $Ba(thd)_2(PEDETA)$ (the only difference being that the five methyl groups of PMDETA are replaced with ethyl groups) and therefore it appears that the properties of the disclosed compound and the claimed compound must be very similar. The USPTO does not maintain testing facilities that allow determination of the state of $Ba(thd)_2(PMDETA)$. Furthermore, '522, col. 8, lines 25-30 and col. 10, lines 6-9 teach that the precursor may be supplied as a liquid.

Claims 3-6: The diketone is 2,2,6,6-tetramethylheptanedione (thd) (col. 6, lines 22-33). one of the beta-diketones of Applicant's Table 1, wherein R^1 and R^2 have four carbons and R^3 is hydrogen (which has zero carbons).

Claims 7-9: Pmdeta fits the formula of Applicant's claim 7, wherein R^a-R^c are each methyl (i.e., alkyl) groups and $n=1$.

Claims 14-15: The claimed solubilities must necessarily be features of the disclosed species or else must be caused by essential features which are not present in the claims. Again, it appears that the properties of the disclosed compound $Ba(thd)_2(PMDETA)$ and the claimed compound $Ba(thd)_2(PEDETA)$ must be very similar. Furthermore, WO 98/46617 teaches that amine-adducted beta-diketones are very soluble (p. 5, lines 21-23; p. 8, line 20-23).

7. Claims 1-11, 13-15, and 23-25 are rejected under 35 U.S.C. 102 (a) and 102(b) as being clearly anticipated by Gordon et al., Proceeding-Electrochemical Society, 98-23, 270-279.

Claims 1-11, 13, and 23-25: Table 2 lists Examples 1, 3, 7-9, and 35-39 of the present application.

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Claims 14-15: The claimed solubilities must necessarily be features of the disclosed species or else must be caused by essential features which are not present in the claims.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-9, 14-19, and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum '522 in view of Hintermaier et al. (U.S. Patent 6,303,391, hereafter '391).

'522 states that the MOCVD precursor may be in the form of a liquid, as opposed to in the presence of a solvent (col. 8, lines 25-30), as discussed above. The liquid is vaporized and the vapor is contacted with a heated substrate to deposit a metal-containing compound by MOCVD (col. 8, lines 25-45). The precursor may be used in combination with other precursors to produce mixed metal oxides (col. 10, lines 25-50). '522 does not explicitly state that the amine-adducted beta-diketone is isolated.

However, the selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. '391 teaches that liquid precursors for MOCVD of mixed metal oxides may be provided from separate sources (i.e., in isolation from the other precursors) (col. 10, lines 3-14). Therefore, it would

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have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the precursors of '522 in isolation from one another with a reasonable expectation of success because '391 teaches that providing vapors of the precursors in isolation from one another is a suitable method of providing precursors in MOCVD of mixed metal oxides.

Claims 19, 22: '522 teaches that the compound may comprise titanium (col. 10, lines 43-50).

11. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum '522, as applied to claim 1, above, and further in view of Sandy (U.S. Patent 4,189,306, hereafter '306).

'522 is discussed above, but does not explicitly teach the use of compounds of the formula of claim 7 wherein at least one of the R substituents contains more than one carbon atom and does not teach the specific amines and complexes of Tables 2-8.

However, as discussed above, '522 teaches that the amine ligand is pmdeta wherein Applicant's R^a-R^e are each methyl (i.e., alkyl) groups and n=1. Sandy '306 teaches that methyl groups in amine adducts that enhance the solubility, stability, and volatility of metal beta-diketones (col. 4, lines 32-45) may be substituted by hydrogen or ethyl, propyl, or butyl groups (col. 4, lines 28-31; col. 2, lines 8-33). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have chosen each of R^a-R^e independently from the group of hydrogen, methyl, ethyl, propyl, or butyl with the expectation of similar results because '306 indicates that such ligands are equally operable as substituents on amines used to stabilize volatile metal beta-diketones. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07.

12. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum '522 in view of Hintermaier '391, as applied to claim 1, above, in view of Sandy '306 for substantially the same reasons discussed above regarding claims 10-13.

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13. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baum '522 in view of Hintermaier '391, as applied to claim 1, above, in view of Summerfelt (U.S. Patent 5,589,284, hereafter '284) and Tong et al. (U.S. Patent 5,464,453, hereafter '453) and

'522 and '391 are discussed above. '522 teaches making a barium strontium titanate film but do not explicitly teach that the method includes a spin coating or sol-gel process to deposit a layer of metals or metal oxides.

'284 teaches depositing a ruthenium oxide film (36) and a barium strontium titanate film (42), but does not teach particular methods of forming the films. '522 and '391 teach the method of forming a barium strontium titanate film discussed above. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the method of '522 and '391 as the particular method of forming the BST film of '284 with a reasonable expectation of success because '522 and '391 teaches a suitable method of forming BST films.

'453 teaches that a ruthenium oxide coating may be deposited by sol-gel, spraying or spin coating (col. 6, line 40-col. 7, line 15). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have deposited the ruthenium oxide film of '284 by sol-gel, spraying or spin coating with a reasonable expectation of success because '453 teaches that they are operative methods of forming ruthenium oxide coatings.

14. Claims 1-9, 14-18, 20-21, and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirlin et al. (U.S. Patent 5,280,012, hereafter '012) in view of Gordon (WO 98/46617, hereafter '617).

Claims 1-2, 23-25: '012 teaches MA_yX (col.5, lines 5-33), where M may be barium, A may be diketones such as acetylacetone, and X may be amines (col. 9, lines 6-58) as MOCVD precursors. Particular precursors are isolated for study (See Table VI). '012 does not explicitly teach that the precursors are liquids. However, '617 teaches that liquid precursors offer the advantages over solids described at pp. 2-3. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the precursors of '012 in liquid form in order to have avoided the difficulties described by '617. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have

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chosen the species of MA_yX that are liquids at lower temperatures, such as 60° and/or 20 °C in order to have minimized the amount of energy required to liquefy the precursor.

Claims 3-6: The diketone may be 2,2,6,6-tetramethylheptanedione (thd) (col. 9, lines 35-38), one of the beta-diketones of Applicant's Table 1, wherein ¹R and R² have four carbons and R³ is hydrogen (which has zero carbons).

Claims 7-9: '012, Table VI teaches that the amine may fit the formula of Applicant's claim 7, where R^a-R^e are each hydrogen and n=1. Example 14 of '617 teaches Pmdeta, which fits the formula of Applicant's claim 7, wherein R^a-R^e are each methyl (i.e., alkyl) groups and n=1.

Claims 14-15: The claimed solubilities must necessarily be features of the disclosed species or else must be caused by essential features which are not present in the claims. Also, WO 98/46617 teaches that amine-adducted beta-diketones are very soluble (p. 5, lines 21-23; p. 8, line 20-23).

Claims 16-18: The vapor of the substance is contacted with a heated substrate (p. 9, lines 5-16) to form barium carbonate (Example 14) or magnesium oxide (Example 11) film.

Claim 20-21: The material may be deposited by spin-coating or sol-gel coating (p. 6, lines 19-20).

Claims 23 and 25: The beta-diketones may be the same ('012, Table VI).

15. Claims 19 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirlin '012 in view of Gordon '617, as applied to claim 16, above, and further in view of Hintermaier '391.

'012 and '617 teach that the MOCVD precursor may be in the form of a liquid, as opposed to in the presence of a solvent (p. 3, lines 16-24), as discussed above. The liquid is vaporized and the vapor is contacted with a heated substrate to deposit a metal-containing compound by MOCVD (p. 9, lines 5-14). The precursor may be used in combination with other precursors to produce mixed metal oxides (pp. 9-10). '012 and '617 do not explicitly state that the amine-adducted beta-diketone is isolated to deposit mixed metal oxides

However, the selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v.*

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Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). See MPEP 2144.07. '391 teaches that liquid precursors for MOCVD of mixed metal oxides may be provided from separate sources (i.e., in isolation from the other precursors) (col. 10, lines 3-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the precursors of '012 and '617 in isolation from one another with a reasonable expectation of success because '391 teaches that providing vapors of the precursors in isolation from one another is a suitable method of providing precursors in MOCVD of mixed metal oxides.

Claims 19, 22: '012 teaches that the compound may comprise bismuth (Example XXIX).

16. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirlin '012 in view of Gordon '617, above as applied to claims 1-2, above, and further in view of Sandy '306 for substantially the same reasons discussed above regarding claims 10-13.

Response to Arguments

17. Applicant's arguments, see pp. 10-14, filed 2/11/2004, with respect to the rejections of claims 1-21 under 35 USC 102(e) and 35 USC 103(a) based on Gordon '983 have been fully considered and are persuasive in view of the amendments to claims 1 and 16 and the statement of common ownership. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the above cited art.

18. Applicant's arguments filed 2/11/2004 have been fully considered but they are not persuasive.

Regarding the rejections under 35 USC 112, 1st and 2nd paragraph, Applicant has pointed to the definition in the specification and Gordon et al., *Proceeding-Electrochemical Society*, 98-23, 270-279 of "dmtpdeta" and "thteta" and has stated that the use of the abbreviation "dbeta" was an obvious error for the correct abbreviation "dbeda" and has amended the specification accordingly (pp. 8-9 of the response). These statements are convincing and therefore, the rejection of claims 12-13 under these grounds is withdrawn. Applicant argues that the meaning of "thteta" can be reasoned from the remaining specification.

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(Note: The full scope of claims 1, 16, 24, and 25 do not find support under 35 USC 112, 1st paragraph in the provisional application 60/105158. Accordingly, claims 1-25 are not entitled to the filing date of 60/105158. Therefore, WO 98/46617 and Gordon et al., Proceeding-Electrochemical Society, 98-23, 270-279 are available as prior art under 35 USC 102(a).)

Conclusion

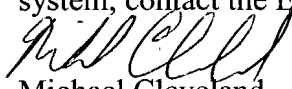
19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Vaarstra (U.S. Patent 6,273,951) is cited its teachings of amine-adducted metal beta-diketones.

Miller et al. (U.S. patent 4,501,602) is cited for its teachings of the affects of Lewis base adducts on the volatility and stability of metal beta-diketones. See col. 7, lines 14-25.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (571) 272-1418. The examiner can normally be reached on Tuesday-Friday and alternate Mon, 8-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Michael Cleveland
Patent Examiner
May 14, 2004